Biogas Utilization Perspectives

July 19, 2012

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> Biomass Consulting Services Sustaining Energy into the Future

Multiple Biogas Energy Uses Creating Value

- Biogas Development Can Be Utilized for:
- Electricity, low value, low margin
- Renewable Pipeline Quality Natural Gas, low value, low margin
- CHP higher value, higher margin
- Vehicle Fuel, highest value fuel substitution, highest margin and contributes to energy independence

Landfill Microturbine Installation Electricity Generation



Farm Anaerobic Digester-Electricity



Reciprocating Engine



Engine Monitoring and Switchgear Interface With Utility



Farm Anaerobic Digester-Pipeline Quality



Pipeline Quality Biogas Treatment Requirements & Considerations

- Moisture removal
- Hydrogen sulfide removal
- VOC removal
- CO₂ removal
- Safe, utility controlled interconnection

Pressure Swing Absorption Gas Clean-up



bNG interconnection with Pipeline Utility

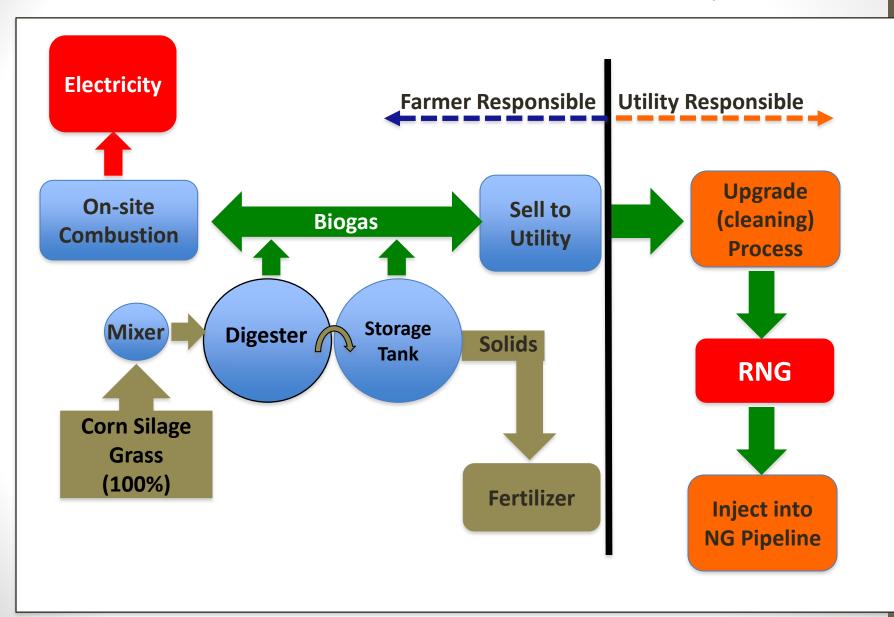


Pragmatic Barriers to Premium Pricing of RE

- A compilation of opinions:
- Utilities must satisfy many stakeholders: customers, shareowners, regulators, interest groups...
- Must weigh "price is everything" vs. "environment is everything," must blend needs
- Marketplace drives price, there must be greater demand for "premium" priced renewable energy, no voluntary programs (subscribers share price premium risk) are fully subscribed today
- Low cost alternative energy sources, coal, NG, wind...

Split Ownership with Energy Utility

not an attractive economic model for utility



Market Barriers to Utility Grid Sale of Biogas



- Revenue is dependent on local utility, they will accept power, it's a matter of how much they will pay. They must pay "avoided cost"
- Utilities have an obligation to provide low cost energy and high reliability, there are greater reliability and liability risks purchasing power from an inexperienced energy provider.
- Access to transmission system for "wheeling" to another utility is expensive and complex
- Poor economy has resulted in utilities having underutilized or idle generation assets
- RE mandate is on course WI Goal 10% by 2015, 2012 target 4.2%, 2012 achieved 7.0%, little incentive to buy more.
- Smaller generators have market disadvantages, lack of economy of scale

Institutional Barriers

- Lack of uniform interconnection standards across utility and state jurisdictions, concerns about system protection
- Net metering? why pay more for energy when there's lower cost idle generation assets
- Some utilities charge high access and/or interconnection fees
- Lack of renewable energy credits & other environmental or RE incentives
- Lack of energy/emission policy, uncertainties...DOE, USDA, EPA, State/Local Regulations...
- Modest state RPS's, easily subscribed with subsidized wind

Policy Assistance

Reward risk while encouraging demand:

- Property tax exemption & / or tax incremental financing
- Emission/nutrient management credits
- Voluntary green energy purchase, production or investment tax credits
- State-federal-local government agencies, purchase of "green" power
- RE industry sharing voluntary program marketing costs
- Energy subsidies, such as ethanol and wind have had
- Allow utility (ESCO) investment in utility service territory, capital investment by utilities in smaller systems
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Brings Greatest Value to Biogas

Fuel Substitution without Subsidy



Best Energy Value

Energy Independence!



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